



UOP, Incorporated

Des Plaines, IL

**Ecological Risk
Assessment Work Plan**

**UOP Site
East Rutherford,
New Jersey**

**ENSUR Consulting and Engineering
(Formerly ERT)**

October 1988

Document Number 6020-006-246

308346





Formerly ERT

ENSR Document No. 6020-006-246
ENSR Reference No. 52-MCW-198
ENSR/NJDEP-40

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October 17, 1988

Mr. James Schnitzer, Case Manager
NJDEP Bureau of Federal Case Management
401 East State Street
5th Floor, West Wing
Trenton, New Jersey 08625

Re: Report Entitled: "Ecological Risk Assessment Work Plan
UOP Site, E. Rutherford, NJ"

Dear Mr. Schnitzer:

Enclosed are seven copies of the above-referenced work plan for the UOP Site, East Rutherford, New Jersey.

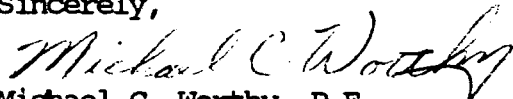
This work plan is based on guidance received in a letter from the NJDEP dated August 22, 1988 and on a technical session attended by representatives of NJDEP, UOP, Inc. and ENSR on September 20, 1988.

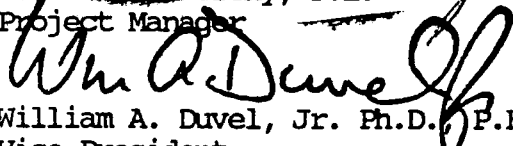
The scheduling of the tasks in this work plan is very sensitive. As we discussed in the September 20 meeting, nearly immediate NJDEP approval of the Focused Environmental Assessment (Section 3) is needed. Without rapid approval, the ability to collect sufficient quantities of F. heteroclitus will be severely impaired due to this species' migration to deeper water in cold weather.

Please note that a production system difficulty was encountered on the submittal day, consequently, the fold out figures (2-1 and 3-1) could not be submitted with the reports. They will arrive at NJDEP one day after the work plan.

If you have any questions regarding this submittal, please contact Lawrence Geyer, UOP at 312-391-2675.

Sincerely,


Michael C. Worthy, P.E.
Project Manager


William A. Duvel, Jr. Ph.D. P.E.
Vice President

MCW:WAD/bl
Enclosures

UOP, Incorporated

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1. INTRODUCTION

In May 1986, UOP Incorporated entered into an Administrative Consent Order (ACO) for completing Remedial Investigations (RI) and initiating Feasibility Studies and Remedial Actions at the UOP National Priority Listed Site in East Rutherford, NJ. As part of the RI process, a baseline human health risk assessment, to evaluate direct pathways for the UOP Site, was submitted to the New Jersey Department of Environmental Protection (NJDEP) in October 1988. In order to complete the risk assessment requirements of the ACO, indirect (food web) pathways to humans and ecological risk must also be evaluated for the site. This plan delineates the studies and analyses to be conducted to complete the baseline risk assessment for the site. The preliminary survey (Section 2) including the initial site visit, collection of available data, and selection of indicator compounds was conducted prior to the submittal of this work plan as discussed with NJDEP in September 1988.

2. PRELIMINARY SURVEY

The preliminary survey is designed to identify potential areas of ecological concern at the site, and select a representative subset of the species present in the area to serve as indicator organisms. Terrestrial and aquatic habitats are evaluated separately.

2.1 Site Visit

The initial site visit was conducted October 6 and 7, 1988 to identify reference areas, construct species lists, and sample vegetation, terrestrial fauna, and aquatic fauna. The following sampling activities were performed in advance of the work plan to provide input to the indicator species selection process. Data analyses are underway.

2.1.1 Site Walkover and Identification of Reference Areas

Upland and wetland portions of the site, both within site investigation areas and reference areas, were examined to construct initial species lists for vegetation, evaluate vegetation assemblages, and make general observations for evidence of use by animals.

Reference areas were selected from uncontaminated portions of the site or nearby habitats based on the similarity of vegetation assemblages in candidate reference areas and contaminated site areas. The criteria that were used to judge similarity are:

- Identical or similar species composition,
- Similar spatial extent
- Similar relief and exposure

Matched reference and on-site study areas were surveyed in the same manner. Any differences between matched areas will be evaluated as to the potential for stress attributable to contamination.

2.1.2 Vegetation Survey

Terrestrial herbaceous vegetation in reference and study areas were surveyed using the point intercept method (Appendix B). Interval length and number of transects necessary for adequate sampling were determined separately for each vegetation assemblage after the initial site walk over (Appendix B: SOP No. 670-087). Data from sampling will be analyzed to determine:

- relative density: $(\text{total individuals of species } x + \text{total individuals of all species} \times 100)$,
- cover (a measure of dominance): $(\text{total intercept length of species } x + \text{transect length} \times 100)$,
- relative cover: $(\text{total intercept length of species } x + \text{total intercept length for all species} \times 100)$,
- frequency: $(\text{number of intervals in which species } x \text{ occurs} + \text{total number of transect intervals} \times 100)$,
- relative frequency: $(\text{frequency of species } x + \text{total frequencies for all species} \times 100)$.

Woody vegetation (trees and shrubs) are relatively sparse at the site. These were sampled from a subset of transects by the point-centered quarter method (Appendix B: SOP No. 670-088).

2.1.3 Terrestrial Fauna Survey

The terrestrial fauna survey for the site consisted of observations to be made during the site walkover. In addition to actual sitings of invertebrates, mammals, birds, reptiles,

and amphibians, observations were made pertaining to habitat site use for forage and nesting.

Birds were observed during the preliminary site visit for estimation of site contact and behavioral activities. Observations were made at regular intervals during the daylight hours of the site visit (see Appendix B: SOP No. 670-057).

2.1.4 Aquatic Invertebrate Survey

Zooplankton and benthic invertebrates were sampled from Ackerman's Creek (on-site) and Walden Swamp (the predetermined reference area) (Appendix B: SOP No. 670-055). Zooplankton samples were taken using horizontal tows of an 80 micron mesh plankton net. Benthic invertebrates were sampled using a Ponar dredge, screened and preserved in the field (Appendix B: SOP No. 670-057). The sampling locations are shown in Figure 2-1. The sampling "areas" (A, B, and C in Ackerman's Creek and Walden Swamp reference area) represent segments of stream channel as designated by NJDEP for the Focused Environmental Assessment. Three samples each of zooplankton and benthic invertebrates were taken from each area at approximately the thalweg of the stream channel.

2.1.5 Fundulus Population Survey

Fundulus heteroclitus is the indicator species selected for the focused environmental assessment (see Section 3.0). F. heteroclitus was sampled with minnow traps during the preliminary survey. Sample locations are the same as for the aquatic invertebrate survey (Figure 2-1) and are approximately the same locations as for the focused environmental assessment. Fish from each sampling area were marked (by fin clipping) and returned to the same sampling area. Each area has a unique marking designation (A-caudal, B-right pectoral, and C-left pectoral). A minimum of 150 fish from each sample was marked. Recapture success will be determined by fin

observations during F. heteroclitus sampling for the Focused Environmental Assessment (Section 3). This survey will provide information on the population size and movement behavior of F. heteroclitus.

2.2 Available Data Review

Existing site-specific and area (Hackensack River estuary) ecological studies and data are being collected and reviewed so that appropriate evaluation of conditions at the site can be made.

2.3 Selection of Indicator Species

Although numerous species exist at the site, it is not necessary to examine each one specifically to generally determine the potential for ecological risk posed by contaminants at the site. Based on the results of the preliminary survey and available data review, indicator species have been selected for the site to represent various plant and animal taxa, and trophic levels. The proposed indicator species and the rationale for their selection is presented below:

- Fundulus heteroclitus - The mummichog is the most common forage fish in the stream channels. It has also been designated by NJDEP as the indicator organisms for the focused environmental assessment. This fish's behavioral patterns suggest that it may be significantly exposed to sediments, and as a forage species it represents a potential link to higher trophic levels.
- Callinectes sapidus - The blue crab is found in and around the Berry's Creek area. It is a scavenger, and is readily exposed to sediments. This species may be consumed by humans.

- Palaemonetes pugio - The grass shrimp is an important pelagic component of the food web in the UOP area, and is found in both the on-site stream channels and in Walden Swamp. Toxicity studies concerning this species and PCBs are available.
- Congeria sp. - One species of mussel is abundant in on-site and reference areas. As a filter-feeding benthic invertebrate, some individuals of this species may be exposed to high indicator compound concentrations in sediments given the heterogeneous distribution of the contaminants.
- Chironomidae - Larvae of the aquatic midge family, Chironomidae, also appear to be present in both on-site and reference area channels. These benthic insects spend the majority of their life-cycle feeding on detritus and microscopic organisms in sediments.
- Anas platyrhynchos - Mallards nest in the meadowlands area and have been reported from the site. These ducks feed by dabbling in stream channels, and they may be hunted and consumed by humans. Toxicity studies concerning mallards and PCBs are available.

The above six taxa represent several trophic levels of the aquatic ecosystem of the Berry's Creek area. No primary producers were chosen because this predominantly is a detrital-based food web. No mammals, reptiles, or amphibians were chosen as aquatic indicator species because:

- Little or no evidence was found of aquatic/semi-aquatic species in the on-site or reference areas, and
- Birds (such as mallards) are more representative of higher order vertebrates which utilize this habitat.

No upland species were chosen as indicator organisms. As discussed with NJDEP, it is not necessary to evaluate terrestrial species unless the preliminary site visit documents evidence of vegetative stress (or other potential effects). These analyses are underway and preliminary results do not indicate the need to include terrestrial organisms.

3. FOCUSED ENVIRONMENTAL ASSESSMENT

The purpose of the focused study is to assess the potential biological risk of PCB contamination associated with the UOP site. The fish species Fundulus heteroclitus will be collected and analyzed in order to determine the level of PCB bioaccumulation in the fish tissues. These data will also be used to assess the potential risks posed by the bioaccumulation of PCBs to higher trophic level organisms including human receptors (see Section 5). Sediment samples will also be collected and analyzed for PCBs to compare with fish tissue concentrations.

3.1 Sample Collection

It is planned to collect Fundulus heteroclitus using minnow traps. Traps will be baited and set on the incoming tide, and harvested after 6 to 12 hours. Due to the possibility of differential uptake of PCBs as a function of fish bodysize, two general size classes (large/small) will be collected as part of each sample. To assure adequate sample quantities for analysis, approximately 250 grams of fish tissue will be collected for each of the forementioned subsets for each sampling location.

One surface sediment sample will also be collected at each sampling location. A stainless steel petite Ponar dredge will be used to retrieve sediments, the actual sample consisting of only the top 4 centimeters of the grab (see Appendix A for detailed description).

3.2 Sample Locations

For the purpose of designating sample locations, Ackerman's Creek will be divided into three general areas: the upper, middle and lower portions. The areas are generally represented by sampling locations designated as A, B and C,

respectively, in Figure 3-1. Three sampling locations are specified for each area and each sample is to be collected from the thalweg of the channel. Three locations in the reference area (Walden Swamp) will also be sampled. A randomly chosen duplicate sample will be taken at one of the 12 locations.

3.3 Analytical Parameters

Prior to analysis, fish samples will be subject to a gut clearance process to last between 8 and 24 hours. During this time the fish will be isolated from sediments and detritus which could affect tissue concentrations. Samples will then be immediately preserved (on ice) to avoid alteration of tissue PCB concentrations due to physiological stress. One duplicate for each of the fish and sediment samples will be taken for use as quality assurance. Any samples used for quality assurance (replicates/duplicates) will be indistinguishable from the other samples sent to the lab. For additional details concerning analytical protocols see Appendix A.

Fish - Analytical Parameters

- individual body lengths
- individual wet weight
- composite PCB concentration (by Aroclor)
- composite lipid content
- composite dry weight

Sediment - Analytical Parameters

- PCB concentration (by Aroclor)
- pH
- grain size distribution
- total organic carbon

3.4. Data Analysis

Data will be analyzed with the objective of determining correlations among PCB concentrations in the sediments and in fish tissues. A comparison will also be made between the reference area (Walden Swamp) and the on-site sampling locations. Ultimately, this information will be used in both the ecological and the indirect exposure pathways assessments.

4. ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment will be conducted to evaluate the probability of an adverse environmental effect due to exposure to contaminants at the site. This includes a comparison between ecotoxicity data and exposure concentrations at the site for individual indicator organisms. In addition, the potential impacts and implications for effects to populations, assemblages, and ecosystem function will be evaluated.

4.1 Ecotoxicity Assessment

Indicator compounds have already been chosen for the UOP Site as part of the public health risk assessment, and since indirect pathways to humans are being evaluated as part of this investigation, those chemicals will continue to represent the indicator compounds. In addition, any additional and abundant site chemicals will be reviewed to determine their toxicities to wildlife. The ecotoxicity together with the concentration and frequency of occurrence at the site will be used to determine if any additional indicator compounds should be added for the ecological risk assessment.

Summaries of the ecotoxicity of each chosen indicator compound to aquatic and terrestrial organisms will be prepared. Representative acute and chronic endpoints (benchmark concentrations) will be tabulated for indicator organisms.

4.2 Exposure Assessment

The exposure assessment will consist of identification and quantification of the various pathways by which the biota may be exposed, and a characterization of these exposed populations. In this assessment, the data collected in the preliminary survey will be used to characterize the ecosystem,

and the chosen indicator organisms will be used to evaluate exposure.

Water, soil, sediment, air, and biota are potential exposure media. Exposure concentrations for each exposure media will be estimated from existing site data and those data generated as part of the focused environmental assessment. For quantification of indirect pathways (food web), bioconcentration factors and/or bioaccumulation models will be used. Comparisons of expected environmental concentrations with relevant standards and criteria will also be made.

4.3 Risk Characterization

Comparisons between toxicological benchmark concentrations (acute and chronic) and expected environmental concentrations will be made to estimate the risks to biota from on-site exposure. Toxicity quotients will be calculated for terrestrial organisms. Uncertainty factors will be applied to toxicity quotients calculated for rare or endangered species if any have been identified at the site. Probabilities of adverse effects instead of toxicity quotients will be calculated for aquatic indicator organisms when data are sufficient.

4.4 Impacts to Populations and Assemblages

Once the potential risks to individual organisms have been estimated, the possible impacts to populations, assemblages, and ecosystem function may be estimated. Evaluation of the potential effects to populations rather than assemblages or ecosystems will be emphasized because:

- Generally, an adverse effect to a single individual does not automatically carry biological significance to the population as a whole, and

- Population dynamics are better understood and more easily predicted than effects due to alterations among species interactions and ecosystem functions such as primary production.

For indicator organisms, potential adverse effects to a population will be evaluated by extrapolating from concentration-response functions for individuals (from ecotoxicity studies) with simple population models (e.g., logistic model). Possible effects to interacting populations as well as ecosystem functions will be evaluated only qualitatively due to the complexities, uncertainties, and data requirements associated with their quantification.

5. HUMAN HEALTH RISK ASSESSMENT THROUGH INDIRECT EXPOSURE PATHWAYS

5.1 Identification of Complete Exposure Pathways

Indirect exposure pathways are those in which humans are exposed to contaminants through the food chain, instead of being exposed directly with a contaminated media. These pathways are to be evaluated in the ecological risk assessment instead of being included with the public health risk assessment. For an indirect pathway to be complete, contamination from the site must be incorporated into the food chain and ultimately into organisms which are then consumed by human receptors. Potential pathways to be evaluated for the site include consumption of contaminated:

- Fish and shellfish,
- Game (such as duck).

5.2 Estimation of Doses

If one or more indirect pathways is found to be complete, then doses must be estimated. To estimate dose, both the tissue residue of the contaminant of concern and the consumption rate must be known or estimated.

Body burdens will have been generated as part of the ecological assessment for indicator organisms, however, the majority of these species are unlikely to be consumed by humans. They may represent food sources for the consumed species, however. The potentially consumed species will generally have home ranges which exceed the boundaries of the site which means they will feed on off-site food items in addition to those which may be contaminated from on-site. Also, given the generally widespread nature of contamination in the Hackensack River area, available body burden data from far ranging, consumable species can not be attributable to the

site. For these reasons, tissue residues will be estimated for consumable species based on bioaccumulation from site food items which are only a fraction of their total diet. Consequently, the estimated tissue residues may not represent total tissue residues (from all sources, both on and off site) and will predict incremental risk only. Consumption rates will be estimated from national averages and available area data.

5.3 Estimation of Risk

Risk characterization combines the estimated dose with a knowledge of the toxicity of the indicator compound, and the procedure is different for carcinogens and noncarcinogens. To quantify the carcinogenic risk, the exposure dose will be multiplied by a value that represents the carcinogenic potency of an indicator compound to produce a unitless risk number which is the 95% upper bound estimate of the probability of contracting cancer over and above background cancer rates. For noncarcinogens, the calculated exposure dose will be compared to a reference dose which is a dose expected to be without adverse health effects. If the ratio of the exposure dose to the reference dose (called a Hazard Index) is less than one, then the exposure dose is assumed to be safe.

6. SCHEDULE AND REPORTING

After NJDEP approval of the Focused Environmental Assessment Work Plan (Section 3), Fundulus and sediment sampling will be conducted at the site. Up to two weeks will be required for mobilization, but every effort will be made to complete the sampling in November 1988 while Fundulus are anticipated to still be in on-site stream channels. Sample analysis will take six weeks. Data reduction and analysis, bioaccumulation modeling, ecotoxicity assessment and risk characterization will require three months to complete following NJDEP approval of this entire work plan and receipt of data. A draft ecological risk assessment report will be provided following the completion of the elements of this work plan (see milestone schedule, Figure 6-1).

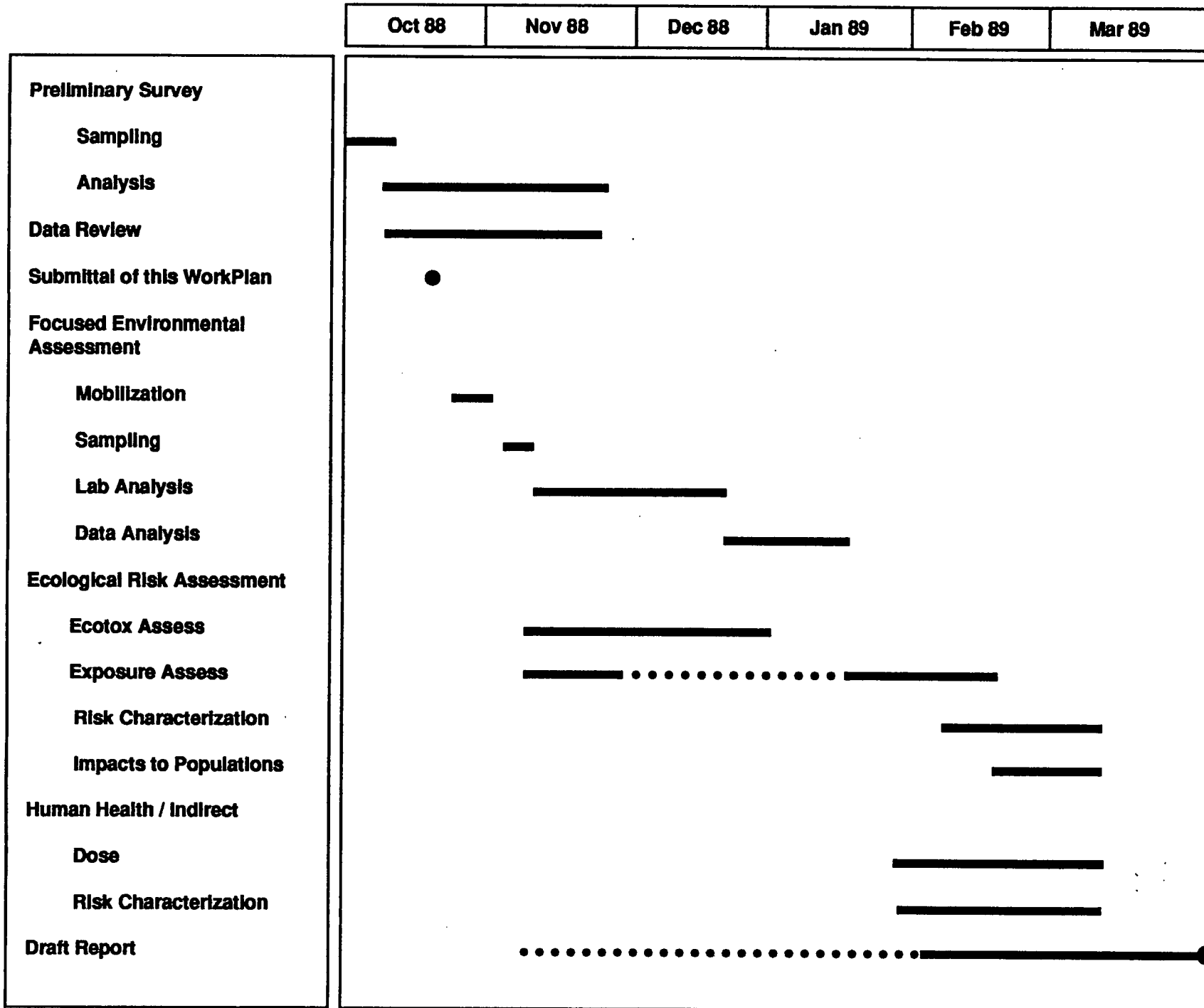


Figure 6-1 Milestone Schedule

APPENDIX A

QUALITY ASSURANCE

Procedures

This appendix describes the quality assurance procedures to be followed for the collection, shipping and analysis of samples for the Ecological Risk Assessment at the UOP Site. All personnel that will perform the procedures describes in the workplan will be qualified professionals trained by the team leader or designee and will have read the appropriate quality assurance procedures before beginning work at the site. The sections that follow are labeled as:

- Data/Sample Collection
- Decontamination
- Documentation
- Sample Preservation and Analytical Methodology
- Quality Control Samples
- Sample Shipping and Handling

A1. Data/Sample Collection

Data and samples collected at the UOP Site will be acquired following the appropriate ENSR Standard Operating Procedure (SOP), included in Appendix B, incorporating any revisions as noted below. Qualitative information gathering requirements for which no SOP exists are describes below and in the Documentation section.

A1.1 Vegetation Survey

The SOPs to be used in the Vegetation Survey are SOP No. 670-087, Vegetation Sampling by the Point-Intercept Method for the survey of terrestrial and wetland herbaceous vegetation and SOP No. 670-088, Vegetation Sampling by Point-Centered Quarter

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Method for the survey of woody vegetation. The data sheets for these two SOPs will be modified as shown in Figure A-1 for SOP No. 670-087 and in Figure A-2 for SOP No. 670-088. If necessary, vegetation specimens will be collected following SOP No. 670-091, Floristic Voucher Collection.

A1.2 Terrestrial Fauna Survey

Sitings and observations of terrestrial fauna during the site walkover will be recorded in the Field Log Book, described in the Documentation Section A. Avarian observations, made at regular intervals during the daylight hours of the survey, will be recorded as per SOP No. 0085, Surveying Birds Using Time Area Counts.

A1.3 Aquatic Invertebrate Survey

Zooplankton samples will be collected following SOP No. 670-055. Aquatic macrionvertebrates will be collected following SOP No. 670-057.

A1.4 Focused Environmental Assessment Sample Collection

Fish and sediment samples will be collected as part of the focused environmental assessment. Fish samples will be collected using minnow traps. Fish data to be collected in the field such as individual body length, weight, and species will be recorded following SOP No. 670-048, Collection and Treatment of Fish Field Data. Sediment samples will be collected using a ponar dredge as per SOP No. 7140.

A2.4 Decontamination

1. Except as noted below, all field sampling equipment will be laboratory cleaned, wrapped, and dedicated to a particular sampling point. Alternatively, clean,

FIGURE A-1
POINT-INTERCEPT FORM

Date _____

Field Analyst(s) _____ QA Check _____ Project _____

Location _____ Vegetation Type or Site _____ Code _____

Transect No. _____ Transect Length _____ Control Area ☐ Study Area ☐

Orientation _____ Slope (%) _____ Aspect _____

Species Code	1	2	3	4	Intercept		7	8	9	10	Percent Cover	Ht.	Reproductive Status
1					5	6							
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
13													
18													
19													
20													

Tot. Plant Cover													
Litter and Rock													
Total Cover													
Bare Ground													

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Figure A-2

POINT-CENTERED QUARTER DATA

Project # _____ Name _____ Date _____ Q/A check _____
 _____ Vegetation type or site _____ Location _____ Control area ☐ Study area ☐
 Transect # _____ Length _____ Orientation _____ Slope (%) _____ Aspect _____ Observer _____
 Units of measure: Distance _____ (m or ft) ; Height _____ (m or ft) ; Diameter at breast height _____ (in or cm)

POINT	QUARTER															
	A				B				C				D			
	Species*	Dist.	Ht.	DBH	Species*	Dist.	Ht.	DBH	Species*	Dist.	Ht.	DBH	Species*	Dist.	Ht.	DBH
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

INCREMENT BORE DATA

Species	Point	Quarter	Age	Species	Point	Quarter	Age	Species	Point	Quarter	Age	Species	Point	Quarter	Age

Notes : * Also indicate one of the following:
 1 = Flowering
 2 = Fruiting
 3 = Post-fruited
 4 = Non-reproductive in current season

unused disposable field sampling equipment will be utilized,

2. Field cleaning of larger equipment used to obtain sediment samples will consist of a manual scrubbing to remove foreign material and steam cleaning inside and out until all traces of oil and grease are removed. Cleaned equipment will be stored to prevent accidental recontamination.
3. Smaller equipment which may come in contact with the sample will be field cleaned by the following procedure:

- Rinse all loose materials off with water. Use Alconox solution and scrub brush if necessary,
- Rinse with tap water
- Rinse with deionized water
- Rinse with a 10% solution of nitric acid,*
- Rinse with deionized water*
- Rinse with pesticide grade acetone
- Air dry, or purge with compressed nitrogen to dry quickly
- Rinse with deionized water

*only if sample is to be analyzed for metals

A3. Documentation

A3.1 Field Log Book

Daily field notes that are not recorded on any of the data sheets included in the SOPs are to be written in the project field log book. These kinds of information include but are not limited to:

- weather conditions,
- unusual circumstances,

- change in procedures,
- equipment problems, and
- list of photos, if taken, and the description of location and significance.

Each log book page must be signed and dated by the author.
Each entry must be written in ink.

A3.2 Sample Labelling and Shipping

Every sample collected must be labeled with the following information:

- project name,
- sample location.

Each cooler of sediment samples will be accompanied by a four part chain-of-custody form (Figure A-3) identifying its contents. All of the heading information on the form should be filled out at the beginning of sampling activities.

As each sediment sample is collected and placed in the cooler, its sample number and type, the date and time it was collected and the analyses to be performed are entered on the form.

Each sample jar will be placed in an individual bubble wrap bag before being placed in the cooler. When the cooler is filled, additional packing material (bubble wrap and/or vermiculite) will be placed in the cooler so that the contents are snug.

Before the cooler is sealed for shipment, two pieces of chain-of-custody tape will be selected and their serial numbers will be entered on the chain-of-custody form. The person packaging the samples will sign the "relinquished by" box and enter the date and time. The back copy of the form will be separated and will remain with the field records. The original

and remaining copy will be placed inside a waterproof bag placed in the cooler with the samples.

The cooler will then be sealed with strapping tape. The two pieces of chain-of-custody tape will be signed and dated by the packer and affixed across the strapping tape seal in diametrically opposite positions.

When the cooler is received at the laboratory, the laboratory sample custodian will examine the chain-of-custody tape to verify that it is intact. He or she will then open the cooler, retrieve the chain-of-custody form and check to see that the serial numbers of the chain-of-custody tapes just broken agree with those on the form. The custodian will then compare the contents of the cooler to the list on the chain-of-custody form, and will inspect the sample jars for damage. If any samples are damaged, they will be identified by making a note in the "remarks" section of the form. He or she will sign and date the chain-of-custody form in the "Received for Laboratory" box. The copy will be separated and returned to the sender for confirmation of receipt.

- sample identification,
- preservation, if necessary
- parameters to be analyzed,
- signature of sample collector, and
- date of sample collection.

A4. Sample Preservation and Analytical Methodology

The sample analytical methods and preservation technique for each sample type are presented in Table A-1. All samples will be preserved immediately after collection, unless otherwise noted in Table A-1.

The laboratory will be responsible for observing the required extraction and analytical holding times specified in the current CLP Statement of Work.

For PCB analyses the following analytical protocol will be used:

- Use EPA Method 8080 for 80% of all samples, and
- Provide Tier I deliverable analyses for the remaining 20% of all samples.

A5. Quality Control Samples

Duplicate field samples for the small Fundulus composite sample, the large Fundulus composite sample and the sediment sample will be collected at one sampling location. The same sampling procedures used to collect the other field samples will be used to collect these samples. The analytical parameters for these samples will also be the same as the other samples (See Section A5., Sample Preservation and Analytical Methodology).

In addition, as per CLP tier I and II guidelines for PCB analysis the laboratory will analyze three aliquots of one small Fundulus composite sample, one large Fundulus composite sample and one sediment sample at one of the sampling locations. The first aliquot will be analyzed as the field sample, the second as the matrix spike and the third as the matrix spike duplicate. For the other analytical parameters two aliquots of these samples at the selected location will be analyzed. One aliquot will be analyzed as the field sample and the other as the laboratory duplicate, unspiked.

A6. Sample Storage Time

The maximum storage time for each sample from time of collection to time of shipment is 2 days.

TABLE A-1

SAMPLE AND ANALYTICAL METHODS AND PRESERVATION TECHNIQUES

<u>Sample</u>	<u>Analytical Parameters</u>	<u>Analytical Method</u>	<u>Preservation</u>
Vegetation	Species identification	-	Paradichlorobenzene ³
Zooplankton	Species identification, density	SOP No. 670-052	10% Formalin
Macroinvertebrates	Species identification, density	SOP No. 670-058	10% Formalin
Fundulus	PCBs	NJ Tier I and Tier II Methods ⁴	4°C (ice)
	Lipid content	NJ Tier I and Tier II Methods ⁴	4°C (ice)
	Dry weight	NJ Tier I and Tier II Methods ⁴	4°C (ice)
Sediment	PCBs	NJ Tier I and Tier II Methods ⁴	4°C (ice)
	pH	SW-846 ¹ Method 9045	4°C (ice)
	Grain size distribution	ASTM ² Method D422-63	4°C (ice)
	Total organic carbon	SW-846 ¹ Method 9060	4°C (ice)

¹USEPA, Test Methods for Evaluating Solid Wastes, November 1986, SW-846, Third Edition²ASTM, Annual Book of ASTM Standards, Part 19 Soil and Rock; Building Stones.³for cabinet storage⁴An even distribution by location of Tier I on 20% of samples and Tier II on 80% of samples will be used.

CHAIN OF CUSTODY RECORD

Client/Project Name			Project Location			ANALYSES						
Project No.			Field Logbook No.									
Sampler: (Signature)			Chain of Custody Tape No.									
Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample							REMARKS	
Relinquished by: (Signature)					Date	Time	Received by: (Signature)				Date	Time
Relinquished by: (Signature)					Date	Time	Received by: (Signature)				Date	Time
Relinquished by: (Signature)					Date	Time	Received for Laboratory: (Signature)				Date	Time
Sample Disposal Method:					Disposed of by (Signature)						Date	Time
SAMPLE COLLECTOR Environmental Research and Technology, Inc. 696 Virginia Road Concord, MA 01742 617-369-8910					ANALYTICAL LABORATORY						ERT	
											Nº 10978	

APPENDIX B
STANDARD OPERATING PROCEDURES (SOPs)

<u>Title</u>	<u>SOP No.</u>
Vegetation Sampling by Point-Intercept Method	670-087
Vegetation Sampling by Point-Centered Quarter Method	670-088
Floristic Voucher Collection	670-091
Surveying Birds Using Time Area Counts	0085
Sampling Zooplankton by Plankton Net	670-055
Sampling Aquatic Macroinvertebrates by Ponar Dredge	670-057
Collection and Treatment of Fish Field Data	670-048
Lake and Stream-Bottom Sediment Sampling	7140
Lab Analysis of Zookplankton Samples	670-052
Laboratory Processing of Aquatic Macroinvertebrate Samples	670-058



STANDARD OPERATING PROCEDURE

Number: 670-087

Date of Issue: 6/15/79

Title: VEGETATION SAMPLING BY POINT-INTERCEPT METHOD

Organizational Acceptance

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

Ellen Collins

6/15/79

[Signature]

6/15/79

Stephen G. Martin

6/15/79

Edward B. Reed

6/15/79

Revisions

Changes

Authorization

Date

1

Para. 4.3 (amended)

Ellen Collins

10/22/81

STANDARD OPERATING PROCEDURE

Title: 670-087 VEGETATION SAMPLING BY POINT-INTERCEPT METHOD

Date: 10/22/81

Number: 670-087

Revision: 1

1.0 PURPOSE

This procedure describes a method for sampling shrub and ground cover communities.

2.0 RESPONSIBILITIES

The Field Team Leader is responsible for conducting field investigations as assigned by the Discipline Manager or Task Manager. The Field Team Leader is responsible for making sure all field equipment is checked out, in working order, and is transported to the field.

3.0 MATERIALS

- Site maps
- Data sheets (Attachment 1)
- Pencils
- Clippers
- Plastic bags or vasculum
- Metal tags
- Metric tapes
- Field notebook
- Clipboard
- Magic markers
- Fluorescent paint
- Plumb bob
- Plant press
- Fluorescent flagging
- Wooden stakes

4.0 METHODS

4.1 Locating Sampling Points

Sample points are randomly located within each major vegetation type occurring on the study area using a grid coordinate system. Points are plotted on a topographic map or acetate overlay of aerial photos. All sampling points are plotted on a site map. This method of random selection reduces sampling bias and ensures that every point within the study area has an equal chance of being sampled.

The basis for this system is random number pairs; the first number of the pair designates a position on the east-west axis; the second number designates a coordinate on the north-south axis. Each point is assigned a standard number code for identification purposes.

Date: 10/22/81
 Number: 670-087
 Revision: 1

The Field Team Leader locates each point in the field and permanently marks these locations. Wooden stakes painted with fluorescent paint, flagged, and marked with the appropriate code number, are used as field markers. If the sample point location is not visible from a road, specific compass directions accompanied by distances from a road(s), intersection(s), or easily distinguishable topographic feature are recorded. The point at which field personnel must leave a road to find a sample point location is permanently and clearly marked, and the route to the sample point flagged.

One transect is established for each enclosure or random point. Transect orientation will be determined using random or stratified random techniques.

4.3 Sampling Procedures

Cover provided by shrub and ground strata is measured according to a modified point-intercept method (Canfield 1941). Strata are defined as follows:

- o Shrub = woody species taller than 1 m and with a DBH less than 2.5 cm
- o Ground = stems with a DBH less than 2.5 cm and less than 1 m in height

At each 5 m interval along a 50 m line (each 1 m interval along a 30 m line in grassland types), a vertical line is projected perpendicular to the transect line. The first plant of each stratum "hit" by this vertical projection is recorded by species. If the vertical projection "hits" bare ground or litter, it is also recorded (Attachment 1).

Upon completion, data sheets are submitted to the Field Team Leader, who checks for completeness, legibility and accuracy, and ensures that all data sheets are entered into the standard ERT documentation system for processing and filing immediately upon return to the LSC office.

5.0 DEFINITIONS

None

6.0 REFERENCES

Canfield, R. 1941. Application of the line interception method in sampling range vegetation. J. Forestry. 39:388-394.

ATTACHMENT 1
POINT-INTERCEPT FORM

Date _____
 Field Analyst(s) _____ QA Check _____ Project _____
 Location _____ Vegetation Type or Site _____ Code _____
 Transect No. _____ Transect Length _____ Control Area ☐ Study Area ☐
 Orientation _____ Slope (%) _____ Aspect _____

Species Code	1	2	3	4	Intercept		7	8	9	10	Percent Cover	Ht.
1					5	6						
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

Tot. Plant Cover												
Litter and Rock												
Total Cover												
Bare ground												

STANDARD OPERATING PROCEDURE

Number: 670-088

Date of Issue: 6/15/79

Title: VEGETATION SAMPLING BY POINT-CENTERED QUARTER METHOD

Organizational Acceptance

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

<u>Ellen Collins</u>	<u>6/15/79</u>
<u>[Signature]</u>	<u>6/15/79</u>
<u>Stephen G. Martin</u>	<u>6/15/79</u>
<u>Edward B. Reed</u>	<u>6/15/79</u>
_____	_____

Revisions

Changes

Authorization

Date

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QUALITY ASSURANCE
RELEASE
by _____
date _____

STANDARD OPERATING PROCEDURE

Title: 670-088 VEGETATION SAMPLING BY POINT-CENTERED QUARTER METHOD

Date: 6/15/79
Number: 670-088
Revision: 0

1.0 PURPOSE

This procedure describes a method for sampling forest and shrubland communities.

2.0 RESPONSIBILITIES

The Field Team Leader is responsible for supervising field investigations as assigned by the Discipline Manager or Task Manager. The Field Team Leader is responsible for making sure all field equipment is checked out, in working order, and is transported to the field.

3.0 MATERIALS

Site maps
DBH tape
Increment borer
Plastic straws
Masking tape
Clipboard
Data sheets (Attachment 1)
Pencils
Metal tags
Clippers
Plastic bags or vasculum
Metric tapes
Compass
Plant press
Field notebook
Pocket calculator

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date _____

4.0 METHODS

4.1 Locating Sampling Points

Sample points are randomly located within each major vegetation type occurring on the study area using a grid coordinate system. Points are plotted on a topographic map or acetate overlay of aerial photos. Random selection reduces sampling bias and ensures that every point within the study area has an equal chance of being sampled.

Random number pairs are the basis for this method; the first number of the pair designates a position on the east-west axis; the second number designates a coordinate on the north-south axis. Each point is assigned a standard code for identification.

Date: 6/15/79
Number: 670-088
Revision: 0

The Field Team Leader locates each point in the field and permanently marks these locations. Wooden stakes painted with fluorescent paint, flagged, and marked with the appropriate code, are used as field markers. If the sample point location is not visible from a road, specific compass directions accompanied by distances from a road(s), intersection(s), or easily distinguishable topographic feature are recorded. The point at which field personnel must leave a road to find a sample point location is permanently and clearly marked, and the route to the sample point flagged.

The four sampling quadrats are established by passing an imaginary pair of perpendicular lines through the center point in a north-south, east-west orientation.

4.2 Sampling Procedures

The distances from the sample point to the midpoint of the nearest tree (when sampling woodlands) or to the midpoint of the nearest shrub (when sampling shrublands) in each quadrat is recorded (Cottam and Curtis 1956). The DBH of each tree sampled is recorded by species. Slope and aspect data are recorded for each sample point (Attachment 1). The fourth tree occurring at each point is cored. Core samples are stored in plastic straws and ages determined in the laboratory.

Upon completion, data sheets are submitted to the Field Team Leader, who checks for completeness, legibility and accuracy, and ensures that data sheets are entered into the standard ERT documentation system for processing and filing immediately upon return to the LSC office.

5.0 DEFINITIONS

None

by _____
date _____

6.0 REFERENCES

Cottam, G. and J. T. Curtis. 1956. The use of distance measures in photosociological sampling. Ecology. 37:451-460.

Cox, G. W. 1972. Laboratory manual of general ecology. Williams C. Brown Company. Dubuque. 195 pp.

POINT-CENTERED QUARTER DATA

Project # _____ Name _____ Date _____ Q/A check _____
 _____ Vegetation type or site _____ Location _____ Control area ☐ Study area ☐
 Transect # _____ Length _____ Orientation _____ Slope (%) _____ Aspect _____ Observer _____
 Units of measure: Distance _____ (m or ft) ; Height _____ (m or ft) ; Diameter at breast height _____ (in or cm)

POINT	QUARTER															
	A				B				C				D			
	Species	Dist.	Ht.	DBH	Species	Dist.	Ht.	DBH	Species	Dist.	Ht.	DBH	Species	Dist.	Ht.	DBH
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

INCREMENT BORE DATA

Species	Point	Quarter	Age	Species	Point	Quarter	Age	Species	Point	Quarter	Age	Species	Point	Quarter	Age

Notes :



STANDARD OPERATING PROCEDURE

Number: 670-091 Date of Issue: 6/15/79

Title: FLORISTIC VOUCHER COLLECTION

Organizational Acceptance

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

Ellen Collins

6/15/79

[Signature]

6/15/79

Stephen J. Martin

6/15/79

Edward B. Reed

6/15/79

Revisions

Changes

Authorization

Date

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QUALITY ASSURANCE
RELEASE

by _____
date _____

STANDARD OPERATING PROCEDURE

Title: 670-091 FLORISTIC VOUCHER COLLECTION

Date: 6/15/79

Number: 670-091

Revision: 0

1.0 PURPOSE

This procedure outlines methods by which voucher collections of flora are prepared.

2.0 RESPONSIBILITIES

The Field Team Leader is responsible for conducting and supervising field investigations as assigned by the Discipline Manager or Task Manager. The Field Team Leader is responsible for making sure all field equipment is checked out, in working order, and is transported to the field.

3.0 MATERIALS

Digging instruments (spade, knife, etc.)

Clippers

Identification tags

Field notebook

Pen and ink

Maps of site

Plastic bags or vasculum

Complete plant presses (wooden frames, corrugated cardboard, cardboard blotters, newsprint, cotton straps)

Taxonomic key(s)

Hand lens

Ruler (metric)

Dissecting needles

Camera

Film

Dissecting scope

Herbarium cabinet

Paradichlorobenzene crystals

4.0 METHODS

4.1 Collection Locations

Plants may be collected from quadrats or other sampling plots, or as part of a floristic survey.

4.2 Collection

Flowering and preferably fruiting plant specimens are collected in the field. All plant parts of herbaceous species are collected including underground parts such as roots, corms, bulbs, and rhizomes. Shrub and tree specimens are clipped so as to clearly demonstrate leaf arrangement and branching pattern. Each specimen is tagged with an accession number and placed in a plastic collection bag or vasculum until it can be pressed.

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by _____
date _____

Date: 6/15/79
Number: 670-091
Revision: 0

An accession number is recorded in the collector's field notebook along with the following pertinent information: date collected, specific location, any features that may change upon drying such as flower color, height, and odor, and ecological information like slope, available moisture, or exposure (Radford et al. 1974).

4.3 Pressing

Plants are pressed in standard plant presses using blotters and corrugated cardboard dividers. Plants are arranged on sheets of newsprint so that flowers, fruits, leaf arrangement, and upper and lower surfaces are clearly visible.

After specimens have been placed in the press, it is reassembled and placed where good circulation of the air enhances rapid drying. Newsprint and blotters are changed as often as required for expeditious drying.

4.4 Laboratory Treatment

Dried voucher specimens are kept in folded newspaper sheets, one specimen per sheet, and stored in a metal herbarium cabinet. Paradichlorobenzene crystals (moth balls) are used to prevent insect damage.

A standard label is included with each specimen. Labels bear all the information recorded in the collector's field notebook. Herbarium specimens are recorded in the herbarium catalog and a copy sent to the project file.

5.0 DEFINITIONS

None

6.0 REFERENCES

Radford, A. E., W. C. Dickison, J. R. Massey, C. R. Bell. 1974. Vascular Plant Systematics. Harper and Row, Publishers. New York. 891 pp.

ERT
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by _____
date _____

ERT STANDARD OPERATING PROCEDURE

Number: 0085

Date of Issue: 3/04/80

Title: SURVEYING BIRDS USING TIME AREA COUNTS

Organizational Acceptance

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

3/04/80

3/04/80

3/4/80

3/4/80

Revisions

Changes

Authorization

Date

ERT

LIFE SCIENCES CENTER QUALITY ASSURANCE

RELEASE

by Edward B. Reed / sr.

date April 1, 1980

STANDARD OPERATING PROCEDURE

Title: 0085 SURVEYING BIRDS USING TIME AREA COUNTS

Date: 3/04/80
Number: 0085
Revision: 1

1.0 PURPOSE

This SOP describes procedures used for surveying avifauna using time area counts. Procedures have been modified from Robbins and Van Velzen (1967, 1969), Weber and Theberge (1977), and BLM (no date). The technique is useful for (1) shore censusing of waterbirds, (2) censusing songbirds in large open areas where birds cannot be approached, and (3) surveys in dense vegetation where transects are difficult to complete and detectability of birds is hindered by the dense vegetation.

2.0 RESPONSIBILITIES

A field team leader is assigned responsibility for the avian road counts by the Terrestrial Ecology Discipline Manager. Responsibilities include assuring that proper gear and supplies are checked out, in working order, and ready for transport to the field and performing the tasks indicated in this SOP.

3.0 MATERIALS

Clipboard with data sheets
Binoculars
Topographic map(s) or map of project area
Waterproof marking pen
Surveyor's flagging and/or wooden stakes
Thermometer
Field guide
Tape recorder with tape of songs or calls of birds expected (optional)

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RELEASE

by Edward B Reed /pr
date April 1, 1980

4.0 METHODS

4.1 Count Location

A time area count survey consists of a series of observation points along a standard route traversed on foot. The number of observation points on a route, the distance between points, and the distribution of the points within various habitat types is defined in the project work plan, based on the terrain and vegetation at the project site, the type of bird being studied, and on the objectives of the study.

When the survey route is first set up, each observation point is marked with surveyor's flagging or wooden stakes. The number of the observation point is clearly marked on the flagging with a waterproof marker. The location of each stop is plotted on a topographic or project area map.

Date: 3/04/80
Number: 0085
Revision: 1

When the route is first set up, habitat characteristics of each observation point are qualitatively recorded on a standard data form (Attachment 1). Each is classified by habitat type, according to a classification scheme defined in the project work plan. Unique habitat features are also recorded.

4.2 Field Procedures

At the beginning and end of each survey the observer records the appropriate information at the top of the standard data sheet. As the survey is run the observer records the common name of each species identified and the number observed at each stop. At each observation point the observer looks and listens for a specified time period and records, by species, the number of birds seen or heard at any distance, in all directions. Surveys of songbirds use a 3-minute observation period. Surveys of other groups use varying time periods as specified in the project work plan. Some project work plans may specify a distance beyond which no observations are recorded. No distinction is made between visual and aural detections in recording the data. Flyovers are recorded separately. Birds observed between observation points are not recorded for density estimates but are included in qualitative observations.

RELEASE

4.3 Time of Day

by Edward B. Reed/pr
date April 1, 1980

Time area counts may be used during all seasons of the year; however, the survey starting time varies with the season to correspond to periods of greatest bird activity. During the breeding season, greatest activity occurs in the early morning and surveys are begun one-half hour after sunrise. In winter, bird activity increases later in the morning (Shields 1977), so the starting time is delayed until one and one-half hours after sunrise. Some project work plans may specify other starting times based on the species under investigation.

4.4 Weather Conditions

Time area counts are not conducted during periods of fog, precipitation, or when winds consistently exceed 3 on the Beaufort Scale.

4.5 Replication

In each sampling period identified in the project work plan, the time areas count survey is completed twice (within the same week but not on the same day). The survey route is completed in reverse order the second day.

Date: 3/04/80
Number: 0085
Revision: 1

4.6 Data Sheet Quality Control in Field

Each field person is responsible for double-checking data sheets for completeness and legibility and for providing the data sheets to the field team leader at the end of each day's sampling.

5.0 DEFINITIONS

None

6.0 REFERENCES

- BLM. no date. Nongame bird inventories and studies. U.S. Bureau of Land Management Manual 6611 - Draft. U.S. Bureau of Land Management, Washington, D.C.
- Robbins, C. S., and W. T. Van Velzen. 1967. The Breeding Bird Survey, 1966. U.S. Fish and Wildlife Service Special Science Report 102. 43 pp.
- Robbins, C. S., and W. T. Van Velzen. 1969. The Breeding Bird Survey, 1967 and 1968. U.S. Fish and Wildlife Service Special Science Report 124. 107 pp.
- Shields, W. M. 1977. The effect of time of day on avian census results. Auk 94(2):380-383.
- Weber, W. C. and L. B. Theberge. 1977. Breeding bird survey counts as related to habitat and date. Wilson Bulletin 89(4):543-561.

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RELEASE

by Edward B. Reed / pr
date April 1, 1980

ATTACHMENT 1

Avian Road Count and Time Area Count - Route Description

Project _____ Observer _____ Date _____

Count Location

Route Description:

Stop Number 1	Vegetation Type	Comments & Special Features
---------------	-----------------	-----------------------------

Comments & Special Features

ERT STANDARD OPERATING PROCEDURE

Number: 670-055

Date of Issue: 3/19/79

Title: SAMPLING ZOOPLANKTON WITH PLANKTON NETS

Organizational Acceptance:

Authorization

Date

Originator

Rollin Daggett

3-19-79

Department Manager

[Signature]

3-19-79

Divisional Manager

Stephen G. Martin

3/19/79

Group Quality Assurance Officer

E B Reed

3/19/79

Other

Revisions

Changes

Authorization

Date

ERT
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QUALITY ASSURANCE
RELEASE

by

date

STANDARD OPERATING PROCEDURE

Title: 670-055 SAMPLING ZOOPLANKTON WITH PLANKTON NETS

Date: 3/19/79

Number: 670-055

Revision: 1

1.0 PURPOSE

This procedure provides basic methods for sampling zooplankton using plankton nets.

2.0 RESPONSIBILITIES

A member of the field team is assigned responsibility for zooplankton sampling by the Project Manager or his/her designated representative. Responsibilities include assuring that proper gear and supplies are checked out, in working order, and ready for transport to the field and performing the tasks indicated in the SOP.

3.0 MATERIALS

Conical plankton net (64 μ Nitex mesh; 0.3 m mouth diameter; 1.5m net length)
Plankton bucket (64 μ stainless steel screen) and weight
General Oceanics flow meter
Calibrated nylon line
Squirt bottle
Sample bottles (polypropylene)
Labels
Field notebook
Formalin

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4.0 METHODS

by _____

Vertical net tows are taken from ~~near~~ ^{date} bottom to the surface with a conical plankton net (64 μ Nitex mesh; 0.3 m mouth diameter; 1.5 m net length) at each location. If the sample area is relatively shallow, it may be necessary to make several vertical tows and composite the material into one sample.

The net is lowered to the desired depth, then raised at a uniform speed to the surface. The amount of water filtered by the net is based on flow meter readings recorded immediately before and after towing.

After making the tow, the outside net surface is washed from top to bottom to concentrate the collected material into the plankton bucket. The filtered material is placed in a labeled polypropylene jar and preserved with 5% buffered formalin.

Information recorded in the field notebook and on the labels includes: date, location designation, replicate number, depth, length of tow, type of collecting gear, flow meter readings, and collectors' names.

5.0 DEFINITIONS

None

6.0 REFERENCES

None

STANDARD OPERATING PROCEDURE

Number: 670-057

Date of Issue: 3/19/79

Title: SAMPLING AQUATIC MACROINVERTEBRATES BY PONAR DREDGE

Organizational Acceptance:

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

3/19/79

3-19-79

3/19/79

3/19/79

Revisions

Changes

Authorization

Date

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RELEASE

by

date

Date: 3/19/79

Number: 670-057

Revision:1

Partially submerge the wash bucket and swirl or stir to strain out fine substrate particles. Inspect large stones, sticks and macrophytes for animals, clean and discard. Concentrate the remaining sample material on one side of the screen and scoop into a sample container (one pint polyethylene jar). Preserve and label sample. Preservation is usually in 10% formalin.

4.2 Data Sheet Quality Control in Field

Each field person is responsible for double-checking his/her own field data sheets for completeness and legibility at the end of each sampling day. Field data information may often be project specific, but in most cases, typical data sheets recorded in pencil or indelible ink include the following minimum information:

- o date
- o project name/No.
- o sampling locality (name of water body)
- o station No. (standard throughout sampling)
- o station location description (detailed enough to allow relocating without permanent marker)
- o type of gear used
- o investigator
- o depth (if known)
- o water temperature (if known)
- o sediment type (qualitative description)
- o number of replicates and/or samples

5.0 DEFINITIONS

- 5.1 Aquatic macroinvertebrates - those aquatic invertebrate animals (worms, molluscs, crustaceans, insects, etc.) which are generally large enough to be seen with the unaided eye or are retained on a U.S. Standard No. 30 sieve (0.595 inch opening).
- 5.2 Macrophyte - attached submergent or emergent vascular plants associated with aquatic environments (e.g. duck weed, water cress, rushes, cattails, etc.).
- 5.3 Substratum - composition of the bottom of a lake, river, or stream (e.g., stoney, silty, etc.).

6.0 REFERENCES

None

STANDARD OPERATING PROCEDURE

Number: 670-048

Date of Issue: 3/1/79

Title: COLLECTION AND TREATMENT OF FISH FIELD DATA

Organizational Acceptance:

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

<u>Line Samson S</u>	<u>5-1-79</u>
<u>P. C. C.</u>	<u>3-1-79</u>
<u>Stephen G. Martin</u>	<u>3/1/79</u>
<u>E. B. Reed</u>	<u>3/1/79</u>
_____	_____

Revisions

Changes

Authorization

Date

ERT
LIFE SCIENCE CENTER
QUALITY ASSURANCE
RELEASE

by _____

date _____

Date: 3/1/79

Number: 670-048

Revision: 1

When project requirements do not necessitate individual length - weight measurements, fish are tallied by species in length groups. Tallies by length groups are recorded in the section "Length Classed Fish". When counts only are required, a data sheet with the same headings as Attachment 1 but with columns for species and numbers in the body are prepared.

4.2 Weight and Length Measurements

For each species, all fish are weighed and measured and the data are recorded on data sheets (Attachment 1). If more than one sheet is used, the sheets are identified as sheet 1 of x, sheet 2 of x, etc. Measuring board and scales used in the field are calibrated according to manufacturer's instructions and other appropriate methods. All lengths are taken as total lengths in millimeters except sturgeon which are measured in fork length.

Weights are recorded in grams or kilograms. If fish have been covered with sand or other foreign material in the process of capture, this foreign material is removed before weighing the fish.

4.3 Unusual Specimens

Anomalies (e.g., tail or tail-fin deformed, parasitized, part of a fish protruding from the mouth of a slightly larger fish, emaciated condition, etc.), are noted on the data sheet.

4.4 Uncertain Field Identifications

Any specimen that cannot be clearly identified to project specified taxonomic level is returned to the laboratory for identification or confirmation.

4.5 Numerous Small Fishes

When small fish are captured and project requirements permit, these individuals are counted and released as rapidly as possible.

If lengths and weights are required, at least 25 individuals of each species representing the complete range of lengths are preserved for analyses in the laboratory.

The remainder of each species are counted and released. Both the number counted and the notation of specimens collected, are recorded on the same sheet.

4.6 Threatened and Endangered Species

Special effort is made to return threatened or endangered species to the water in an uninjured condition after weighing and measuring. Unless voucher specimens are required and special permission is obtained, threatened and endangered species are not retained.

ERT[illegible]

Class								
Count								
Class								
Count								

STANDARD OPERATING PROCEDURE

Number: 7140

Date of Issue: 1st Quarter, 1984

Title: Lake and Stream-Bottom Sediment Sampling

Organizational Acceptance

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

<i>Christopher C. [Signature]</i>	<i>3/2/84</i>
<i>Arthur S. [Signature]</i>	<i>3/2/84</i>
<i>Edmund [Signature]</i>	<i>3-2-84</i>

Revisions

Changes

Authorization

Date

1

Update

<i>SHW</i>	<i>3/2/84</i>
<i>ALC</i>	<i>3/2/84</i>
<i>WC</i>	<i>3/2/84</i>
<i>Em</i>	<i>3-2-84</i>

STANDARD OPERATING PROCEDURE

Page 2 of 5
Date:
Number: 1st Qtr
Revision: 712

Title: Lake and Stream-Bottom Sediment Sampling

- Methanol dispenser rinse bottle
- Chemical free paper towels
- Sample logs
- Sample containers/labels
- Six-foot folding rule
- 100 foot tape measure
- Goggles/eye protection
- Wader-type rubber boots (shallow streams)
- Boat or raft (deep rivers and lakes)
- Plastic spoons
- Plastic or galvanized steel basin

5.0 Method or Protocol

5.1 General Procedure

Sediment samples will be collected from the upper one-half foot of bottom sediment. Samples from small streams will be collected either from the bank or by wading into the stream. Sediment samples from ponds, lakes or large rivers will be collected from a boat or raft so that a position can be established areally for adequate characterization of sediment composition.

Samples will be collected and immediately placed in the sample containers appropriate for the analyses to be performed. Sample containers for most analyses will be placed in standard glass jars. Samples for volatile organic compound analysis will be placed in septum vials. The types of cap liners used will depend on the analyses to be performed. For all sampling applications except metals analyses tin foil cap liners will be used. For metals analyses, teflon or plastic cap liners will be used.

5.2 Standard Procedures

- 5.2.1 Consult the project sampling program and select the sample location. Record the sample point orientation on a map or plan of the stream, brook or lake.
- 5.2.2 Using the weighted measuring tape, obtain a measurement to the bottom of the stream, river or pond. Enter the depth on the Sediment Sample Log shown in Table 1.
- 5.2.3 Obtain the Ponar® dredge and place the jaws in the lock-open position. The Ponar® dredge should be used for the first sampling attempt at each point.

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Title: Lake and Stream-Bottom Sediment Sampling

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6.0 Documentation

A field notebook will be maintained into which all observations during sampling will be entered. In addition, a Sediment Sample Log will be completed for each point.

All sample volumes and bottle types will be noted and all bottles will be labeled at the point of collection. Chain of custody forms will be completed for each group of samples, by container, prior to transport off-site and at a minimum at the end of each field day.

7.0 References

EPA, Handbook for Sampling and Sample Preservation of Water and Wastewater
EPA-600/4-82-029, September, 1982



STANDARD OPERATING PROCEDURE

Number: 670-052

Date of Issue: 3/19/79

Title: LABORATORY ANALYSIS OF ZOOPLANKTON SAMPLES

Organizational Acceptance:

Originator

Department Manager

Divisional Manager

Group Quality Assurance Officer

Other

Authorization

Date

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3-19-79

[Signature]

3-19-79

Stephen G. Martin

3/19/79

2 B Reed

3/19/79

Revisions

Changes

Authorization

Date

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QUALITY ASSURANCE
RELEASE

by _____

date _____

STANDARD OPERATING PROCEDURE

Title: 670-052 LABORATORY ANALYSIS OF ZOOPLANKTON SAMPLES

Date: 3/19/79

Number: 670-052

Revision: 1

1.0 PURPOSE

The purpose is to provide basic methods for the processing of zooplankton samples in the laboratory. This SOP is appropriate for samples taken by all types of gear (i.e., plankton tows, pumps, grabs, Clarke-Bumpus samplers).

2.0 RESPONSIBILITIES

A member of the laboratory staff is assigned responsibility for zooplankton analysis by the Laboratory Supervisor and Zooplankton Group Leader. Responsibilities of the Laboratory Supervisor include assuring that all samples are received in good condition, logged-in, and handled according to established QA/QC procedures. The Laboratory Supervisor also initiates a work order form and coordinates sample analysis with the Zooplankton Group Leader.

The Group Leader assures that all samples are analyzed according to work order specifications; data are properly recorded and filed; reference collections are accurately prepared and catalogued; and samples are properly handled after analysis (i.e., stored, discarded, etc.).

3.0 MATERIALS

Compound microscope
Dissecting microscope
Bogorov counting chamber
Microscope slides and cover slips
Calibrated pipette
Dissecting needles
Multiple-tally counter

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4.0 METHODS

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4.1 Check-in Procedure

Sample check-in and log-in procedures are described in SOP 620-005.

4.2 Sample preparation

Processing techniques such as subsampling or staining are used as specified in the scope of work. The techniques to be used for each project are usually specified in a laboratory work order.

4.3 Sample Analyses

After the appropriate sample and subsample volumes are determined, the samples are examined. Each subsample is examined using a Bausch and Lomb stereozoom binocular microscope (10-70X). All organisms are identified and enumerated in the first subsample. In the second subsample all taxa are counted except those which are abundant in the first subsample (greater than 30 organisms). Additional subsamples are examined for less abundant taxa (those that are less than a total of 30 in the first two subsamples), if the zooplankton density is relatively low.

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If possible, at least 10% of the sample is examined. The same volumes and counting procedures are repeated for all samples representing a particular sample date.

Taxonomic identifications are accomplished by individuals usually specified in the project work plans. The level of taxonomic identification is specified in the project scope of work. In most instances, all adult Cladocera and Copepoda are identified to species; immature Copepoda are enumerated as nauplii, calanoid copepodites, cyclopoid copepodites, and harpacticoid copepodites. Rotifera are identified to the lowest possible level (usually genus or species).

A reference collection for each project is routinely made and maintained.

Taxonomic and enumeration checks are made by a taxonomist not assigned to the project, if specified in the project work plans.

After the samples have been analyzed, all data and summary sheets are filed in the laboratory and work study area. Samples are treated according to specifications in the work order or project work plan.

5.0 DEFINITIONS

None

6.0 REFERENCES

None

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STANDARD OPERATING PROCEDURE

Number: 670-058

Date of Issue: 3/06/80

Title: LABORATORY PROCESSING OF AQUATIC MACROINVERTEBRATE
SAMPLES

Organizational Acceptance

Originator

Department Manager

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Other

Authorization

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3/6/80

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3/6/80

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3/6/80

Revisions

Changes

Authorization

Date

ERT
LIFE SCIENCES CENTER
QUALITY ASSURANCE
RELEASE

by

date

Date: 3/06/80
Number: 670-058
Revision: 0

4.0 METHODS

4.1 Pre-Analysis Sample Processing

Organisms are hand sorted from the debris and placed in snap cap vials containing 70% isopropyl alcohol with glycerine.

4.2 Sample Analyses

Organisms in the samples are generally identified and counted. Taxonomic identifications are accomplished by professional biologists. Characteristically, the level of taxonomic determinations is specified in the project scope of work, and is often described as the "lowest taxonomic level practicable". Taxonomic and enumeration cross-checks are routinely made by a taxonomist not assigned to the project.

A reference collection for each project is routinely made and maintained.

After the samples have been analyzed, all data are properly filed and the sample remainder disposed of according to specifications in the work order or according to project requirements.

5.0 DEFINITIONS

None

6.0 REFERENCES

None

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Dry Temp. _____ °C Dry Time _____ Ash Temp. _____ °C Ash Time _____

#	Gross Fresh	Tare	Net Fresh	Gross Dry	Tare	Net Dry	Gross Ash	Tare	Net Ash	Ash Free
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[illegible]